LA-UR-21-21797
Approved for public release; distribution is unlimited.

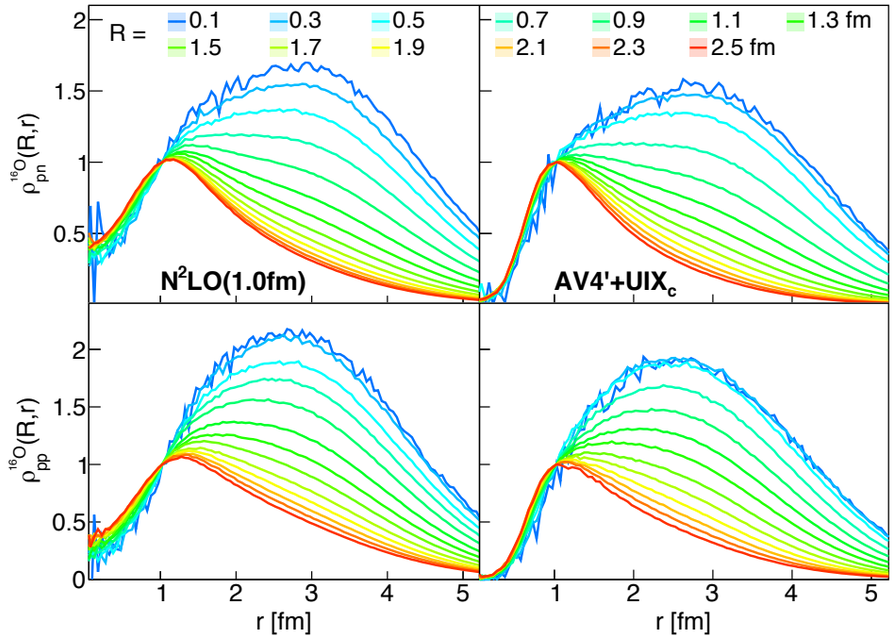
Title: Many-Body Factorization & Position-Momentum Equivalence of SRC

Author(s): Lonardoni, Diego

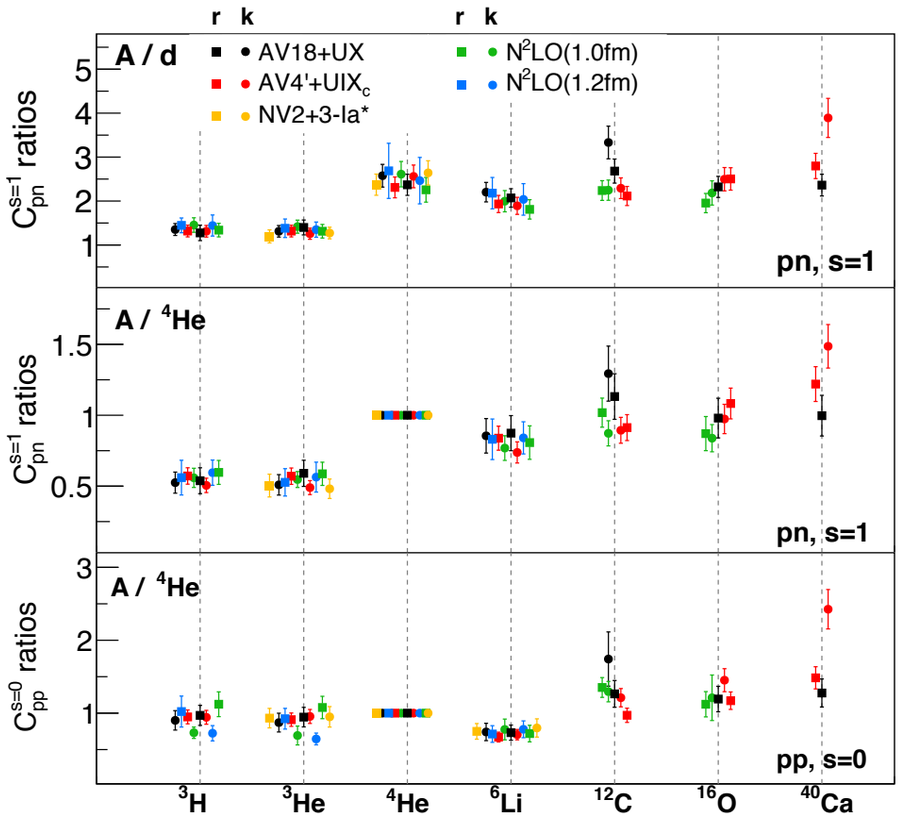
Intended for: One-Page Publication Highlights

Issued: 2021-02-23

Many-Body Factorization & Position-Momentum Equivalence of SRC



QMC scaled two-body coordinate-space densities in ^{16}O.



pn and *pp* nuclear contact ratios for nuclei *A/d* and *A*/^{4}He.

Objectives

- We study short-range correlations (SRC) using the generalized contact formalism (GCF) and quantum Monte Carlo (QMC) calculations of nuclei from deuteron to ^{40}Ca.
- We employ different realistic nuclear interactions and extract spin/isospin-dependent nuclear contacts in both coordinate and momentum space.

Impact

- We observe a universal factorization of the nuclear many-body wave function at short distance into a strongly interacting pair and a weakly interacting residual system, the latter consistent with that of an uncorrelated system.
- Nuclear contacts are the same in r- and k-space, and contact ratios between two different nuclei shows very little dependence on the nuclear interaction model.
- Conclusions: *1.* SRC effects are predominantly embedded in two-body correlations. *2.* The relative abundance of short-range pairs in a nucleus is a long-range (*i.e.* mean field) quantity that is insensitive to the short-distance nature of the nuclear force.

Accomplishments

- R. Cruz-Torres, D. Lonardoni *et al.*, Nat. Phys. (2020)
- M. Urban, Nat. Phys. News & Views
- J. Chu, Phys.org